changes which take place in the values of a and e due to the revision of the elements of the orbit.

The mass of the system corresponding to the parallax given above, and the mean distance and periodic time used in its derivation, is 1.89, the mass of the Sun being taken as unity. The components of this pair are slightly unequal in brightness, and perhaps also in mass. One may be as massive as the Sun, but it can not much exceed it.

The mean distance at which these stars perform their revolutions is about four times that of the Earth from the Sun. But owing to the eccentricity of the orbit the range in distance is enormous. At periastron the stars are separated by a space only a little greater than two astronomical units, while at apastron it is five of these units.

It would form an interesting analytical problem to investigate the effect of tidal action upon the relative orbit in this system. The data are pretty well ascertained. Broadly speaking, the stars have spectra of the solar type, and being comparable with the Sun in mass, it would seem not unreasonable to assume that their densities are approximately the same as that of the Sun.

February 23, 1903.

ASTRONOMICAL OBSERVATIONS IN 1902.

MADE BY TORVALD KÖHL, AT ODDER, DENMARK.

VARIABLE STARS.

*Z Cygni.**

Jan.	1:	Z invisible.	Oct.	12:	id.
	5:	id.		21:	id.
	11:	id.		25:	id.
	13:	faint $<$ e.		28:	id.
	16:	id.	Nov.	2:	id.
June	1:	$=$ b.		20:	id.
	28:	$<$ c. / $>$ d.		21:	id.
Sept.	7:	invisible.		30:	$=$ d.
	29:	faint $<$ e.	Dec.	17:	$>$ b. / $<$ a.
Oct.	8:	id.		20:	id.

* *Vide* the sketch in the *Publications* A. S. P., No. 48, page 69.

*S Ursæ majoris.**

Jan. 1: S one step > d.
5: = d.
7: id.
11: id.
13: id.
16: id.
21: id.
30: one step < e.
Feb. 3: two steps < e.
8: id.
15: three steps < e.
22: { < e. / > f. }
Mar. 3: = f.
7: id.
10: { < f. / > g. }
12: one step > g.
22: = g.
24: id.
28: < g.
Apr. 5: id.
6: id.
9: id.
14: id.
June 1: { < e / > f } nearest e.
28: = d.
Aug. 9: { < c / > d } the middle.
11: two steps > d.
26: id.
Aug. 28: three steps > d.
Sept. 1: one step > d.
5: = d.
6: id.
7: id.
13: { > e. / < d. }
17: = e.
18: id.
21: two steps < e.
22: id.
27: { < e / > f } the middle.
29: nearest f.
Oct. 3: one step > f.
8: = f.
12: id.
21: id.
25: id.
28: id.
Nov. 2: < g.
17: invisible.
18: seen < g, air very clear.
19: id.
20: invisible.
21: 11th mag.
30: utmost faint.
Dec. 17: id.
20: > g.
21: id.

T Ursæ majoris.†

Jan. 1 / Mar. 3 } *T* invisible.
Mar. 7: = g.
10: id.
12: = f.
22: = e.
24: { > e. / < d. }
28: = d.
Apr. 5: = b.
6: id.
Apr. 9: id.
14: one step < a.
22: = a.
26: { > a. / = b in the sketch of *S Ursæ*.
June 1: five steps > a.
28: { < b. / > c. }
Aug. 11 / Oct. 28 } invisible.

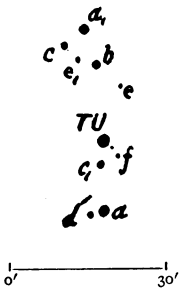
* *Vide* the sketch in the *Publications* A. S. P., No. 73, page 56.
† *Vide* the sketch in the *Publications* A. S. P., No. 22, page 63.

Nov.	2:	faint, < g.	Nov.	30:	id.
	17:	one step < g.	Dec.	11:	= d.
	18:	id.		17:	= b.
	19:	id.		20:	> b. and < a.
	20:	id.		21:	= a.
	21:	id.			
	29:	= f.			

*W Pegasi.**

Jan.	5:	W < h.	Sept.	14:	Almost invisible.
	11:	very faint.		21:	id.
	13:	a little increased, yet < g.		27:	id.
			Oct.	3:	id.
	27:	id.		28:	< h.
	30:	almost = g.	Nov.	18:	id.
Aug.	28:	= h.		21:	id.
Sept.	1:	id.		30:	id.
	7:	id.	Dec.	20:	id.

TU Cygni.



Jan.	1:	T U < f (= 10^m).	Sept.	18:	= b.
	11:	id.		21:	one step > b.
	16:	id.		22:	id.
June	1:	= f.		24:	id.
Sept.	7:	= c.		27:	> b. and < a.
	14:	one step < b.		29:	id.
	16:	id.	Oct.	3:	= a.
	17:	id.		8:	< a. and > b.
				12:	id.
				21:	= a.
				25:	id.
				28:	< a.
			Nov.	2:	id.
				21:	< b. and > c.
				30:	= c.
			Dec.	17:	= f.
				20:	< f.

* *Vide* the sketch in the *Publications* A. S. P., No. 60, page 23. (*h* is the little star in the line between a_2 and *e*.)

Nova Persei.

	h.	m.		h.	m.
Jan. 1	6½ P. M.	7.2	Apr. 26	9	8.4
5	6	7.5	Aug. 11	12	9.0
6	6	7.4	26	9	9.0
7	8	7.4	28	9	9.0
11	6	7.4	Sept. 1	9	9.1
12	10½	7.4	5	9	9.1
13	8½	7.4	7	11½	9.1
14	7	7.4	13	8	9.1
16	6	7.6	14	9	9.2
21	6	7.6	16	9	9.1
27	9	8.0	17	8	9.1
30	8	7.7	18	8	9.2
31	8	8.1	19	8	9.2
Feb. 8	10	7.6	22	9	9.2
10	9½	7.6	24	8	9.1
15	7½	7.8	27	7½	9.2
22	8½	7.9	29	9½	9.2
Mar. 7	9	7.9–8.0	Oct. 3	8	9.2
8	8	8.0	12	8½	9.2
10	8	8.0	21	8	9.2
10	10	8.0	25	7	9.2
11	8½	8.2	28	8	9.2
12	8	8.2	Nov. 2	9	9.2
22	8	8.0	17	6½	9.2
24	8	8.0	18	6	9.2
27	8	8.0	21	6	9.2
28	9½	8.0	29	7½	9.2
Apr. 5	8½	8.4	30	5½	9.2
6	8½	8.0	Dec. 11	5½	9.0
9	8½	8.2	17	6½	9.3
14	9	8.1	20	5½	9.2
22	10	8.2	21	6	9.2

The Star BD 20° 1083.

This star has shown remarkable variations in the year 1902. For the comparisons I have used the following stars: *A, B,* and *b,* the variable being named *a.* The BD magnitudes are added here, but it may be noted that I always see A > B.

A = BD 20° 1095, 7.4^m
B = BD 20° 1093, 7.3
a = BD 20° 1083, 7.7
b = BD 20° 1073, 8.2

NOTE.—In Georgetown College's Chart II I have found among other discrepancies, No. 17 decidedly *less* than No. 20. The chart has No. 17 = 8.8 mag.; No. 20 = 8.9 mag.

When the ocular-tube is screwed out until the stars appear as pale disks, it is least difficult to state the variation.

Jan.	11:	a one step > b.	Apr.	5:	= B.
	30:	distinctly > b.		6:	= A.
Mar.	7:	particularly bright, > b.		9:	= B.
	8:	= A.		14:	id.
	10:	id.		26:	id.
	11:	id.	Oct.	25:	< b.
	24:	id.	Nov.	20:	= b.
	27:	id.	Dec.	11:	> b.
	28:	id.		17:	< b.
				20:	id.

Occasionally I also looked out for other variables. *S Vulpeculæ* and *S Draconis* do not seem to have changed their light.

Eclipse of the Moon.

On April 22d, at sunset, according to calculation, the eclipsed Moon should have been observable at the eastern horizon, but on account of mist the red Moon was not seen until it had ascended to an altitude of 5 degrees. The shadow was touching:—

Tycho (west) at	8h	57m P. M.
Copernicus (east) at	8	59.5
(west) at	9	1
Plato (east) at	9	9
(west) at	9	10.5
Posidonius (west) at	9	28
Mare Crisium (west) at	9	42
End of eclipse	9	45

*Shooting Stars.**

Of the meteors observed simultaneously at Uranienborg, Copenhagen, and Odder in August, 1902, only ten yielded the data necessary to calculate their height above the Earth's surface. For these we have the following results:—

No.	Height at the Beginning. Kilometers.	Height at the End. Kilometers.	Real Length of the Path. Kilometers.
1	119	...	..
2	...	110	..
3	...	77	..
4	112	54	72
5	117	90	31
6	57	...	..
7	92	...	..
8	139	86	65
9	87	82	44
10	101	...	..

* The author sends details of observations of 44 shooting stars which were made on the nights of August 9–12, 1902. These we have been obliged to omit.—THE EDITORS.

FIREBALLS.

In the past year twenty-six fireballs have been seen from stations in Denmark and surrounding countries, as follows: *

No.	Time.	Beginning.	End.	Mag.	Station.	Notes.
1	Jan. 6, 8 h 41 m P. M.	NW.	.....	....	Copenhagen ...	Train. Length, 35° to 40°.
5	10, 9 30	E. to W.	in Southern sky.	♀	Göteborg	Blue-white meteor.
7	Feb. 8, 4 45	N. to S.	in Eastern sky.	....	Hobro.....	A beautiful fireball appearing in daylight.
8	14, 6 11 A. M.	SE.	SW. in Southern sky.	....	32 stations in Denmark.	A large meteor exploding into five parts, with trains within a common large train. The largest fragment was as bright as *Venus*. The path, about 400 kilometers long, was traversed in 20 seconds to 25 seconds.
10	Apr. 2, 1 45	SSW.	NNE., passing zenith.	....	Copenhagen ...	Lighted up the whole region. Blue-white, exploding into four parts.
11	6, 5 54 P. M.	.....	SE. 45° altitude.	....	Nyköbing S....	White meteor, seen by sunlight.
13	15, 9 10	*Denebola*.	*Perseus*, between *Pollux* and the Moon.	♀	Odder.....	The first 5 degrees of the train were reddish. When passing *Pollux*, the fireball exploded into two parts. Duration, 20 seconds. Observed by EMANUELA KÖHL. Also seen at other places; disappeared above the North Sea.
14	20, 10 00	.....	Just East of the Moon.	1-10☾	Copenhagen....	Train 3 degrees long; duration 3 seconds.
20	Sept. 10, 11 5	.....	25° altitude, SE.	♃	Kolding	The meteor was red, its train green. Path 10 degrees long.
23	Nov. 9, 5 30	NW. to SW.	in Northwestern sky.	....	Lemwig	Exploded into two, and these afterwards into several parts. Slow. Train. Also seen at Tönder, Hamburg, and other stations.

* The details of the ten most interesting of these meteors are here given.—THE EDITORS.